SYLLABUS

DATE OF LAST REVIEW : 02/11/2013

CIP CODE: 47.0614

SEMESTER: Departmental Syllabus

COURSE TITLE: Hybrid/ Electric Vehicle Internal Combustion Engines and Alternate Power

COURSE NUMBER: AHEV0212

CREDIT HOURS: 3

INSTRUCTOR: Departmental Syllabus

OFFICE LOCATION: Departmental Syllabus

OFFICE HOURS: Departmental Syllabus

TELEPHONE: Departmental Syllabus

EMAIL : Departmental Syllabus

KCKCC-issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE(S): AUTT0162, AUTT0181 or approval by the instructor.

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore, http://www.kckccbookstore.com for the required text for your particular class.

COURSE DESCRIPTION:
The student will learn the theory and operation of the internal combustion engine as it relates to hybrid systems. Studies will also include alternate power systems including diesel, CNG, and fuel cell technology. The course will emphasize the importance of safety due to the deadly nature of the high voltage environment. Students are required to purchase their own high voltage class 0 gloves to participate in live lab experiences. For every task in Hybrid Electric Vehicle Combustion Engines and Alternate Power, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of
chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**METHOD OF INSTRUCTION:**
A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

**COURSE OUTLINE:**
All students must comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

I. High Voltage Electrical Safety
   A. Electric Shock
   B. Tool and Equipment Usage
   C. High Voltage Safety Rules
   D. Electrical Isolation
   E. Service Disconnect Switch Systems
   F. CAT III Environment

II. Gasoline Internal Combustion Engine hybrids
   A. Atkinson cycle
   B. Miller cycle
   C. Cylinder dropping
   D. Model specific designs
   E. Cooling systems
   F. Cold operation
   G. Service differences

III. Diesel internal combustion engine hybrids
   A. Clean diesel technology
   B. Vehicle specific designs
   C. Service differences
   D. Biodiesel

IV. Alternate fuel internal combustion engine hybrids
   A. CNG
   B. Natural gas

V. Mechanical hybrids
   A. Air compression
   B. Other mechanical systems

VI. Fuel cell hybrids
   A. Hydrogen cells
   B. Other types of cells

**EXPECTED LEARNER OUTCOMES:**
A. The student will be able to describe high voltage electrical safety
B. The student will be able to remove and install an HEV engine
C. The student will be able to explain the differences in hybrid gasoline internal combustion engines
D. The student will be able to perform diagnostics on HEV ICE
E. The student will be able to explain the operation of diesel internal combustion engines
F. The student will be able to explain other alternate fuel internal combustion engines
G. The student will be able to describe types of mechanical hybrids
H. The student will be able to explain operation of different types of fuel cell hybrids

COURSE COMPETENCIES:

The student will be able to describe high voltage electrical safety
1. The student will be able to define high voltage and explain the implications of human interaction
2. The student will be able to explain the purpose of personal protection equipment and what they do
3. The student will be able to demonstrate how to wear high voltage personal protection equipment
4. The student will be able to demonstrate when and where personal protection equipment will be worn
5. The student will be able to demonstrate how to disable high voltage

The student will be able to remove and install an HEV engine
6. The student will be able to remove and install a HEV internal combustion engine (ICE)
7. The student will be able to remove and install transmission from two types of HEV engines

The student will be able to explain the differences in hybrid gasoline internal combustion engines
8. The student will be able to explain how the Atkinson cycle works
9. The student will be able to explain how the Miller cycle Works
10. The student will be able to describe cylinder dropping
11. The student will be able to perform cylinder leakage and compression tests
12. The student will be able to discuss some model specific design differences
13. The student will be able to describe ICE cooling systems
14. The student will be able to describe how cold operation differs from standard ICE
15. The student will be able to explain what service differences are between ICE and HEV
16. The student will be able to explain what differences are present for emission controls

The student will be able to perform diagnostics on HEV ICE
17. The student will be able to perform cylinder leakage test and compression tests
18. The student will be able to perform scantool diagnostics of base ICE controls
19. The student will be able to perform model specific service diagnostics for two different vehicles

   The student will be able to explain the operation of diesel internal combustion engines
20. The student will be able to explain what makes clean diesel technology possible
21. The student will be able to describe some of the vehicle specific designs in production
22. The student will be able to describe service differences between diesel and other engines
23. The student will be able to explain the advantages of biodiesel

   The student will be able to explain other alternate fuel internal combustion engines
24. The student will be able to explain advantages and disadvantages of natural gas
25. The student will be able to explain advantages and disadvantages of ethanol and alcohol based fuels

   The student will be able to describe types of mechanical hybrids
26. The student will be able to describe how an air compression engine works
27. The student will be able to describe other mechanical systems

   The student will be able to explain operation of different types of fuel cell hybrids
28. The student will be able to explain how a fuel cell works
29. The student will be able to explain how other types of fuel cells could offer hope for future HEV

ASSESSMENT OF LEARNER OUTCOMES:
Student progress is evaluated by means that include, but are not limited to, exams, written assignments, and class participation.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff that is free of bigotry and discrimination. Kansas City Kansas Community College is committed to providing a multicultural education and environment that reflects and respects diversity and that seeks to increase understanding.
Kansas City Kansas Community College offers equal educational opportunity to all students as well as serving as an equal opportunity employer for all personnel. Various laws, including Title IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination be administered without regard to race, color, age, sex, religion, national origin, physical handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the Director of the Academic Resource Center, in Rm. 3354 or call at: 288-7670.